House Money and Entrepreneurship[*]

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Abstract

We examine the relationship between house prices and entrepreneurship using micro data from the US Census Bureau. Increases in house prices are often thought to drive entrepreneurship through unlocking the collateral channel for bank loans, but this interpretation is challenged by worries regarding omitted variable biases (e.g., rising local demand) or wealth effects (i.e., that wealthier people are more likely to enter entrepreneurship for reasons other than access to collateral). We construct an empirical environment that utilizes very localized price changes, exploits variations in initial home values across residents in the same zip code, and embeds multiple comparisons (e.g., owners vs. renters, homestead exemption laws by state). For the United States during the 2000-2004 period, the link of home prices to the rate of entrepreneurship is relatively small in economic magnitude. This is despite a focus on a time period that experienced the largest concentration of US home price growth over the last two decades. While collateral plays a role in the entry that we observe, wealth effects appear to be more important.

JEL Classification: E44, G21, L26, M13, R12, R31, R32.

Key Words: house prices, mortgages, collateral channel, entrepreneurship, entry.

1 Introduction

To what extent do small businesses face credit constraints in countries with well-developed capital markets? If they do, what role can housing collateral play in alleviating these constraints? These questions have received renewed interest following the sharp decline in home values during the 2008 financial crisis, where academics and policy makers have argued that the reduction in the value of housing collateral may have led to a decline in entrepreneurship.

The potential role of the collateral channel in entrepreneurship is intuitive. Debt financing is important for small and young businesses (e.g., Berger and Udell, 1998; Robb and Robinson, 2014), but the challenges associated with asymmetric information in small business lending are difficult for banks to overcome (e.g., Stiglitz and Weiss, 1981). Pledging personal collateral against business loans aids the lending process, and thus increases in the value of a potential or current entrepreneur's home raises the value of the collateral they can pledge to the bank and may therefore boost the willingness of banks to lend to their business. The degree to which the collateral channel alleviates credit constraints is thus of particular interest to policy makers, because reforms associated with homestead exemptions in bankruptcy or subsidies to mortgage financing can change the relative costs of owning a home or the value of housing collateral to the bank, and hence could directly impact small businesses' access to external finance (e.g., Berkowitz and White, 2000; Cerqueiro and Penas, 2014; Bracke, Hilber, and Silva, 2014).

Studies that exploit regional variation in house price changes to quantify the impact of the collateral channel often judge the effects to be significant. For example, Schmalz, Sraer, and Thesmar (2014), Fairlie and Krashinksky (2012), and Harding and Rosenthal (2013) find large elasticities when examining entry into entrepreneurship. Adelino, Schoar, and Severino (2013) trace the collateral channel to job creation by US small firms, and Hyytinen and Ylhäinen (2014) find related evidence in Finland. Black, de Meza and Jeffreys (1996) provide some of the earliest evidence in this regard. While our paper is related to this work, features of our data allow us to take a new empirical approach and consider detailed variation across home owners within zip codes. This affords greater assurance against omitted variables, such as booming local demand and economic growth, that can bias estimates on house prices and their relationship to new firm formation. The data also allow greater progress at disentangling collateral effects from other channels that could couple house price appreciation and entry—most prominently, wealth effects, where growing house prices increase the wealth levels of entrepreneurs and lead them to start new businesses, *independent of collateral requirements of banks*. As Hurst and Lusardi (2004) demonstrate, the non-linear nature of wealth levels and entrepreneurship make this question especially tricky.

Our setting is a unique laboratory to study these questions—the United States after 2000. We focus on 2000-2004, using data both before and after as described below. Home price appreciation

during this period was massive, averaging 45% for our sample and 43% for the country as a whole. Figure 1 shows how this period holds the most rapid price appreciation since 1990, and provides a special opportunity to look for effects. The advantage of this "event study" goes beyond the size of the treatment, as the decision to buy a house before 2000 was unlikely to be driven by the expectation of rapid increases in the availability of collateral. Further, many accounts of the price increases like Mian and Sufi (2009) emphasize supply-side components from changes in lending practices. Mian and Sufi (2011) demonstrate a willingness and ability of individuals to borrow against these rapid price appreciations for uses like consumption or home improvements, and perhaps others used this opportunity to access loans for starting new businesses.

Yet, we overall find the impact of this rapid price growth to be quite modest for the likelihood of engaging in entrepreneurship. We have precisely-estimated effects that show home owners in 2000 experiencing rapid price appreciation to be more likely to engage in entrepreneurship by 2004, consistent with the work of others, but the economic size of the effect is modest. To convey this, consider two identical individuals (e.g., age, education, incomes, earnings history) living in the same zip code. The only difference between them is that one individual owns a house at the 25th percentile of value in 2000 (~$95,000) and the other at the 75th percentile (~$225,000). If their zip code experienced the national average growth of 45% in prices during this period, we would expect the first individual to unlock about $43,000 of additional collateral (initial value x price growth), while the second would garner about $102,000. Thus, the individual at the 75th percentile would gain a little under $60,000 additional collateral compared to the individual at the 25th percentile. Yet, despite this large differential in gain, we only estimate a 0.3% higher boost for the individual at the 75th percentile becoming a business owner in 2004 (a net effect inclusive of entry into entrepreneurship and exits out of business ownership). This effect is statistically different from zero, but it is quite small relative to the sample average of 6.7% in 2004 for business ownership (i.e., a 4.4% relative effect).

Thus, one central finding of this study is that house price growth during this period had modest consequences for entry decisions in specifications formulated to discern potential roles for the collateral channels and/or wealth effects. While we come to the conclusion using price variation within zip codes, it is worth noting that our findings are in concordance with the macro trends. Figure 2, taken from Decker et al. (2014), shows the long-term trend decline in the share of US business activity in startups and young firms. There appears to be some slight leveling or bump up during 2000-2004, but the massive house price growth is clearly not matched by the trend in entrepreneurship.[1]

The effects that we measure are free of aggregate demand biases, but their interpretation

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[1]Davis and Van Nieuwerburgh (2014) provide a broader review of the work on the macroeconomic impacts of housing booms and busts.

remains challenging. In the above example, the $60,000 differential could mean that banks can lend more to the new business, which is often assumed to be the driving role. However, the individual at the 75th percentile is also $60,000 wealthier, and wealth effects alone may be driving the 0.3% differential estimated. The wealth effects can encompass engaging in entrepreneurship as a luxury/consumption good, having a greater nest egg and thus tolerance for the income risk and variability associated with firm ownership, and similar. It is essential to note that in these settings, the house price elasticity for entry is properly identified and causal in nature, but the interpretation as collateral effects is incorrect.

We are not able to fully decompose these two, but we do provide evidence that suggests wealth effects are likely more important than collateral effects. First, we find that the boost in entrepreneurship towards capital-intensive industries is not very different from industries that are less intensive, whereas we might have expected a differential to exist if collateral was opening up larger bank loans. Second, there is extensive cross-state variation in homestead exemptions associated with personal bankruptcies. These exemptions are designed to protect home owners from losing their home to creditors, and they vary dramatically across states (e.g., being unlimited in Florida to being limited to less than $20,000 in some states). Prior work shows these exemptions impact credit access from banks, even for collateralized loans, because banks foresee the limits on their ability to seize collateral in defaults (e.g., Cerqueiro et al., 2014). Thus, states with lower homestead exemptions are believed to have more robust use of homes as collateral for bank loans since banks know that they can collect more back. When we split our sample, states with unlimited homestead exemptions show a stronger elasticity than other states, which is the opposite of what one would expect if collateral played a key role. These findings, along with others noted later, suggest overall that wealth effects are likely more important than collateral effects in our sample. At the very least, our analyses suggest that we are estimating an upper bound for the importance of the collateral channel in entrepreneurship.

Section 2 reviews the literature on the relationship between house prices and entrepreneurship, and Section 3 describes our data. We construct a unique platform that combines the Longitudinal Employer-Household Database (LEHD) and the 2000 Decennial Census of Population. The LEHD provides linked employer-employee records such that we can identify the formation of new firms and the initial employees within these firms. The 2000 Census provides us many important details for respondents: income, employment, demographic characteristics, home ownership status, home values, etc. One key piece is the zip code location of a person's home in 2000. This information, combined with trends in house prices for zip codes, allows us to construct very localized price changes and expected price appreciations. A second key piece of information is the reported value of homes in 2000. Due to our large sample, we can use this variation across initial home values to identify home price appreciation effects even after

controlling for zip code level fixed effects. This platform thus offers us a tighter connection than previously possible for linking appreciations in home value with economic behavior while also controlling very closely for aggregate demand effects and other correlated factors. Subject to caveats described later, we also confirm our results are not following from aggregate demand effects by using the local housing supply potential due to city topology quantified by Saiz (2010).

Moreover, we are able to use renters as a "placebo" test for our specifications. As we describe in more detail later, renters are not a true placebo given both positive and negative spillover effects from local house price appreciation, but they do provide us an important comparison point for assessing whether we have identified effects that are truly consistent with collateral or wealth effects. Our data provide monthly rental payments, from which we can estimate the initial value of the dwellings occupied by renters in 2000. We construct a mirror-image analysis using these initial implied values for renters and local house price growth, and we argue that a necessary, but not sufficient, condition for associating entrepreneurship growth due to collateral mechanisms following house price gains is that a null effect be observed for renters. We establish econometric conditions that achieve this goal in Section 4, and also show how weaker conditions allow a renter effect to emerge.

The last section concludes. Our findings are relevant to the literature examining the importance of the collateral channel in driving entrepreneurial outcomes. Several papers document a strong relationship between house price changes and entrepreneurship, as noted above. Although not always directly comparable, our estimates are smaller in economic terms than many of the previous studies. We conclude from this work that housing prices impact entrepreneurship, but that studies need to be very careful in assessing how much of the aggregate demand effect remains embedded in their estimates. We come to a tentative conclusion that, even after the removal of aggregate demand effects, wealth effects are likely more important than collateral channels.

Our findings are relevant also to the extensive literature looking at financing constraints and entrepreneurship. A number of models suggest that individuals are either precluded from entry or that firms enter small and then grow because of the fact that they face initial financing constraints (Evans and Jovanovic, 1989; Holtz-Eakin, Joulfaian, and Rosen, 1994; Rajan and Zingales, 1998; Cooley and Quadrini, 2001; Gentry and Hubbard, 2004; Cabral and Mata, 2004; Cagetti and De Nardi, 2006; Buera, Kaboski, and Shin, 2011). Changes in local banking conditions have been connected with entrepreneurship (e.g., Black and Strahan, 2002; Cetorelli and Strahan, 2006; Kerr and Nanda, 2009). On the other hand, studies looking at entry have questioned the extent to which financing constraints are the leading driver behind entry decisions (Hurst and Lusardi, 2004). Our paper is very consistent with Jensen, Leth-Petersen, and Nanda (2014), who find a causal effect of an exogenous increase in home equity on entrepreneurship,

but find that the effect is small. Our limited effects also parallel the findings of Bracke, Hilber, and Silva (2014) for the United Kingdom.[2]

2   House Prices and Entrepreneurship

Since new businesses typically require some amount of capital investment before they can generate returns, the expected value of a new venture is an increasing function of the capital invested in the startup, up to an optimal level. If individuals face credit constraints, then the amount they invest in the business will be less than the optimal level of capital, lowering expected income from entrepreneurship, and hence lowering the probability that the individual will become an entrepreneur. When the amount an individual is able to borrow is not directly observable, their personal wealth, and in particular their housing wealth, is a good proxy for the collateral they can post to access financing for their business. This is because debt financing is the principal form of external finance for most businesses (Robb and Robinson, 2014). Furthermore, banks often use the personal wealth of the owner to assess creditworthiness of new ventures as they have no track record of the firm's performance on which to lend to the business, even if these are young incorporated firms (Berkowitz and White, 2000).

Using data from the 1998 Survey of Small Business Finances, Table 1 shows that personal real estate is used to collateralize loans to businesses about 20% of the time, and about 10% of respondents note that lack of collateral was the official reason their most recent loan was turned down. A more systematic analysis of the importance of collateral in entrepreneurship faces some challenges. First, those who have more housing equity available to collateralize are likely to be wealthier. This correlation may descend from those who want to become entrepreneurs choosing to build up housing assets to collateralize instead of consuming them. Alternatively, higher ability individuals may be able to generate more assets of all varieties, leading to a possible omitted variables bias problem when estimating the correlation between the stock of housing equity and propensity to engage in entrepreneurship. Therefore, recent studies have used house price appreciation to exploit exogenous increases in wealth as a way to identify the impact on entrepreneurship.

While house price appreciation leads to higher collateral values and hence a higher likelihood of receiving bank financing, exploiting house price appreciation faces two challenges. First, areas with high or rising levels of economic activity will be ones where house prices increase and where entrepreneurship is likely to be particularly attractive. This could simply follow from strong local economic performance influencing many measures, with business starts and house prices being

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[2]Greenstone, Mas, and Nguyen (2014) and Nguyen (2015) are recent contributions to a parallel literature on local lending conditions and existing firm access to credit. Similar to entrepreneurship studies, this work emphasizes the very localized nature of lending relationships to small businesses.

two of them. There could also be a systematic relationship, but with the causal connection being outside of loan markets. This could be due to entrepreneurs responding to changes in household consumption following adjustments in housing wealth (e.g., Mian and Sufi, 2011; Mian, Rao, and Sufi, 2013). Likewise, Stroebel and Vavra (2014) link house price growth to increases in local mark-ups, which could make new businesses more attractive. Thus, separating the impact of aggregate demand from the supply side drivers of credit will be particularly important.

Second, even if one can convincingly show a causal impact of house price increases on entrepreneurship, it still does not fully isolate the mechanism behind the increase in entrepreneurship. While increases in individual wealth reduce credit constraints, they also have the potential to generate wealth effects. For example, wealthy people may have lower absolute risk aversion, making them more likely to become entrepreneurs (e.g., Kihlstrom and Laffont, 1979; Evans and Jovanovic, 1989), or they may have a preference for being their own boss that rises with wealth (e.g., Hamilton, 2000; Hurst and Lusardi, 2004; Astebro and Thompson, 2011; Hurst and Pugsley, 2011; Astebro et al., 2014). If these mechanisms are important, they can lead to a positive association between wealth and entrepreneurship that is independent of the ability of the potential entrepreneur to access bank loans. Put differently, an exogenous increase in wealth may affect entrepreneurship through reduced credit constraints, through wealth effects, or both.

We approach these challenges in several ways. First, we isolate the role of house price increases from local aggregate demand by controlling for aggregate factors at the zip code level and by further comparing the response by home owners to that of renters. Our use of very localized price changes is also important for truly grounding the expected appreciation of the property. We also use housing price elasticities across regions to instrument for exogenous increases in house prices. To parse out credit from wealth effects, we decompose our sample in ways that can shed light on the likelihood of a bank loan being important or even possible: the capital intensity of the industry entered, the homestead exemptions present in the state, the role of entrants versus incumbents, and similar. Many of these techniques have been used at least once in the prior literature. Our central contribution is to bring them into the unique laboratory offered by the data depicted in the next section and to structure them under settings where very localized prices and controls are used to guard against aggregate demand confounders.

3 Data Construction and Sample Statistics

3.1 Data Sources

Our study relies on a unique combination of the Longitudinal Employer-Household Dynamics (LEHD) database and the 2000 Decennial Census of Population. These datasets are confidential

and housed by the U.S. Census Bureau. Built from quarterly worker-level filings by employers for the administration of state unemployment insurance (UI) benefit programs, the LEHD identifies the employees of each firm in the United States and their quarterly compensation.[3] It is longitudinally linked at both the firm and employee levels, allowing one to model how firm employment structures adjust over time, how new entrepreneurial firms form, and how individuals transition into entrepreneurship. This rich data source is currently available for 31 states for research purposes. The initial dates differ across states in terms of inclusion in the LEHD, and we focus on 16 states that have records that begin in 1995 or earlier. This sample includes major states like California, Florida, Illinois, and Texas. The data extend through 2008. The LEHD directly records some information about individuals, such as age, gender, race, place of birth, and citizenship status. Through employment history files, one can also discern earnings and employment histories by job. While our sample period runs 2000-2008, our focus on states starting no later than 1995 allows us to measure meaningful income accumulation over the prior decade.

Using the unique person identifiers we match the LEHD to individual-level records contained in the 2000 Decennial Census of Population (Census).[4] The Census has long-form responses for 1-in-6 of the population, and thus roughly speaking we can match 1-in-6 of our LEHD workers. The long-form is given to a random sample of households for a nationally representative population. With this match comes a true treasure chest of information about individuals (e.g., level of education, occupation, marital status) and their households (e.g., family composition, household income by source, home ownership and values). Importantly for our purposes, the Census asks whether the housing unit occupied by the respondent is rented or owned, how long the family has been living in the residence, how much the monthly rent or mortgage payment is, and what the market value of the unit is.[5]

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[3] The state UI systems cover 95% of private sector employment (Hyatt et al., 2014). Stevens (2007) provides a detailed discussion of the coverage issues.

[4] The Census Bureau creates unique person identifiers (PIKs) that are based on Social Security Numbers (SSN) and allow linking individuals across demographic surveys, censuses and administrative record. PIKs are internal Census identifiers that have a one-to-one correspondence with the SSNs.

[5] The exact question in 2000 is "What is the value of this property; that is, how much do you think this house and lot, apartment, or mobile home and lot would sell for if it were for sale?". Respondents selected from 28 ranges of values, with a minimum of "Less than $10,000" to a maximum of "$1,000,000 or more". We convert these to midpoints, excepting the last category that is simply assigned $1,000,000.

For a limited number of individuals we are further able to match them to the 1990 Decennial Census. The creation of individual identifiers in the 1990 Census was based on tax address files from the Internal Revenue Service, and therefore the matching is mostly limited to individuals who file for taxes as household heads. The overall match rate of the 1990 Census to the LEHD is lower and concentrated on white, non-Hispanic males who reside in urban locations and are household heads. We have used these data thus far to confirm the accuracy of our 2000 information (e.g., we have verified that individuals saying in 2000 that they moved into their home in early 1970s also said this in the 1990 questionnaire). Sampling procedures and limited home price data for the 1990s limit the use of the 1990 match for analytical work.

We build a tailored dataset for the analysis of home prices and entry. We start by retaining individuals who have reported positive earnings in any of our 16 states in each of the three focal years 2000, 2004, and 2008. We require presence at all three points in order to understand the long-term career transitions of these workers. As the LEHD covers only a subset of states, and only businesses paying payroll tax (UI records) within these states, we cannot verify whether a person who is not present is unemployed, independent contractor, self-employed, working in an uncovered state, working in the uncovered federal public sector, or similar. One potential worry with this approach is that the selection procedure might limit the types of individuals considered (e.g., selecting less-mobile people who are then less inclined to start something new). This is not a material concern given the very large states we consider and the high clustering of included and adjacent states shown in Figure 3. Appendix Table 1 also shows that our sample is not behaving differently with respect to mobility in the 2000 Census compared to the nation as a whole.

We match the LEHD individuals to the Census and retain persons covered by the long form. From the Census, we extract individual-level characteristics from the Person File, household and housing-unit characteristics from the Household File, and geographic location details from the Geocode File. We further restrict our sample to individuals aged 25 to 50 in 2000 with non-missing and non-imputed information on all key variables. This age restriction is such that we stay reasonably far away from retirement decisions, as the oldest member of the cohort in 2008 will be 58. Likewise, the minimum age of 25 in 2000 means that we can compute reasonable pre-period earnings for the sample.

We extract the geographical location of the household at the spatial levels of states, counties, and five-digit zip codes. The county of residence is first used to merge in housing price data collected from the Federal Housing Finance Agency (FHFA), following Adelino, Schoar, and Severino (2013). The FHFA data are reported at different levels of geographic detail and are considered reasonably representative of the overall home price development, although they are based on sales of single-family homes and do not include condos.[6] As the lowest level of geographic detail in the FHFA data is a metropolitan or a micropolitan statistical area we use the county of residence to assign the Census respondents into Core Based Statistical Areas (CBSAs), and merge the house price data into the LEHD-Census platform at the CBSA level. A CBSA is one or more adjacent counties that have at least one urban core area of 10,000 or more in population, plus adjacent territory that has a high degree of social and economic integration

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[6]The FHFA website states: "The FHFA House Price Index (HPI) is a broad measure of the movement of single-family house prices. The HPI is a weighted, repeat-sales index, meaning that it measures average price changes in repeat sales or refinancings on the same properties. This information is obtained by reviewing repeat mortgage transactions on single-family properties whose mortgages have been purchased or securitized by Fannie Mae or Freddie Mac since January 1975."

with the core as measured by commuting ties. There are over 900 CBSAs currently defined, and these include 388 Metropolitan Statistical Areas (MSAs, urban core >50,000) and Micropolitan Statistical Areas. Our data cover a total of 173 CBSAs.

For about 85% of the persons in our sample, we are also able to collect home price data from Zillow at the zip code level. Zillow is an online real estate database that uses information from the Multiple Listing Service (MLS) and public record. Zillow maintains data on average home sale prices and estimates of the average home values for zip codes. The coverage of the Zillow data is in part limited by the fact that the data for small zip codes may be sparse to the extent that few home sales occur.[7] Despite these issues, Zillow data have several advantages. First, and by no means least, showing our results with two sources of price data are important for robustness and confidence in the patterns observed. Second, the use of zip code information on price changes will allow us more extensive controls for aggregate demand changes and more refined statements about the impact of prices through housing collateral versus other channels.[8]

Our sample is quite representative of the US housing market and the opinions of respondents about their home values appear reasonable. To show this, we first take an unweighted average of the respondents' estimated home values by zip code. Our unweighted average across zip codes is $188,000, compared to $186,000 for the United States as a whole in the 2000 Zillow data. Second, for the zip codes in our sample, the correlation in the average estimated 2000 value to that reported by Zillow is 0.91.

Our evaluation of firm entry also utilizes the Longitudinal Business Database (LBD), another restricted access Census Bureau dataset that records annual employment at the firm and establishment level. Both the LBD and the LEHD use several levels of establishment and firm identifiers, including the State Employer Identification Number (SEIN) and its federal counterpart (EIN), that are created for tax purposes, and the overall company identifier (ALPHA) that links the establishments of multi-unit companies together.[9] Following the procedures described in Haltiwanger, Jarmin, and Miranda (2013), we create for each establishment the first year during which the firm that the establishment belongs to was observed to be in operation within the LBD. We also create for each firm the number of employees that the LBD reports were working for this firm in the initial year. Approaching entrant definition in this way accomplishes several things—it builds off of the national LBD database to avoid issues related to the partial LEHD

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[7]Zillow has data on 110 million homes across the United States, and so its value series is not limited to just those homes that were recently sold or currently for sale. While the value estimates of a single home have measurement error, the Zillow price trend data can be quite representative of actual changes in market values for local areas.

[8]Guerrieri, Hartley, and Hurst (2013) document features of the variation in house price appreciation across zip codes within MSAs and demonstrate the high correlations across data sources for these localized measures.

[9]The data structure of the LEHD and LBD allow for establishments within each firm to have different industries and locations. Where used in this study, we define the main industry and main location of a multi-unit firm through the facility with the largest number of employees.

state coverage, connects SEINs as appropriate into parent firms, and ensures a consistent definition of entry with prior academic work using the Census Bureau data. Specifically with respect to entry definition, our approach focuses on the formation of employer establishments, whereas the commencement of Schedule C self-employed activity is unmeasured and not considered to be entrepreneurship in this sample.

The LEHD does not designate the founders of a new firm.[10] We use the term "entrepreneur" to describe anyone present in the data who is 1) in an entering firm per the Haltiwanger, Jarmin, and Miranda (2013) definition, 2) present in the LEHD in the first year that the firm entered, and 3) in a firm that entered after 1995. The second condition thus focuses on the initial employees of the firm, and will in some cases include employees other than true business owners. We can think of our work as describing the formation of a founding team and early hires, and we use terms like business ownership and entry in this context. The third condition is imposed by our data. Given the LEHD start dates of 1995 for some states, we are unable to uniformly identify the initial workers for older firms. Thus, in 2000, our sample of existing business owners includes young firms only. As we look towards 2004 or 2008, we continue to designate this initial cohort as an entrepreneur if the firm survives and the individual remains active in the firm (i.e., transitions out do not occur due to firm age). Wage workers are defined as those employees hired after the first year, or those working in establishment founded prior to 1995.

Our analyses also consider survival and growth of businesses and entrepreneurs present in 2000. There are multiple conceptual definitions feasible. Perhaps the most natural is to model the persistence of an individual in entrepreneurship. In this approach, individuals are considered to have survived in entrepreneurship if they are still entrepreneurs in 2004, even if they have changed companies (in other words, they have founded a new company between 2000 and 2004). Related, individuals are said to have left entrepreneurship if they are now a wage worker, even if the original company survived. We find very similar results to those reported below when instead modelling the survival of a business itself. These cases allow the survival of the SEIN without the continued presence of the focal entrepreneur (e.g., the sale of the company), who may now be designated a wage worker in another firm.

3.2 Sample and Key Variables

Table 2 provides descriptive statistics on our sample. Our total sample includes 976,870 workers. (All observation counts in this paper are disguised and "rounded" to end in zero or five according to Census Bureau disclosure restrictions.) This table reports descriptive statistics for the 826,530 workers for whom we have zip code price data. In 2000, 66.7% of individuals in this sample own

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[10]Our data do not record equity ownership of individuals, but the LEHD does contain bonus pay and similar compensation.

homes and are wage workers, and 28.0% rent homes while also being wage workers. Moreover, 5.4% of individuals in the sample are entrepreneurs, with this group comprised of 3.8% being home owners and 1.6% being renters. The home ownership rates of entrepreneurs and wage workers are quite similar at around 70%.

Rows 3 and 4 show the home price appreciation at the zip code level for our sample. Our focus is on the 2000-2004 period, where prices increased substantially, between 43%-53% for the groups. Renters generally live in areas with greater price appreciation. This period provides a strong laboratory for exploring the connection between home prices and entry given the massive adjustments that occurred. Our "event study" window is also dictated by the fact that we only observe respondent home values in 2000.

Rows 5-7 show that the rate of business ownership for this sample grows with time, from 5.3% in 2000 to 6.7% in 2008. This is in large part due to our focus on new firms founded 1995, as the size of this group slowly accumulates. It also reflects a fairly natural progression of business ownership as the cohort ages and becomes wealthier. Of the wage workers in 2000 who owned homes, 3.9% start a business by 2004 and 4.9% do so by 2008. These are net effects that do not capture very short-lived entry, and the 2008 figure allows transition back out of entrepreneurship for the 2004 entrants. These four- and eight-year entry rates are quite reasonable given what is typically reported in the literature. Renters are modestly more likely to transition into entrepreneurship than home owners.

The statistics on business owners in Columns 4 and 5 of these rows can be interpreted as persistence in entrepreneurship of the initial entrepreneurs in 2000. A substantial fraction transition out, especially among renter entrepreneurs. Rows 8 and 9 describe the survival of the SEIN. For wage workers, this means survival of the employer firm. For entrepreneurs, this means survival of the SEIN from which the entrepreneur derives the most income in 2000. Not surprisingly, the entrepreneurial firms show higher failure rates, although their businesses are more persistent than the entrepreneurial survival in the prior rows. The average longevity of these entrepreneurs and their businesses is reflective of other estimates in the literature for new firms, with perhaps a modest increase in survival rates due to the 2000 cohort having already survived the initial "winnowing process" for entrants.

Rows 10-17 provide traits of the groups. Unconditionally, entrepreneurs in the sample are more likely to be male, married, and immigrant than wage workers, while ages and attainment of bachelors' education are mostly similar. The entrepreneurial sample is also less likely to be African American. Renters tend be younger, are more likely to be minorities and immigrants, and are less likely to be married or hold a college degree.

Rows 18-23 show our home value data. The Census collects whether the respondent's home is owned, the estimated value of the home, whether there is an outstanding mortgage on the home,

and the monthly mortgage payment if it exists. (The Census also collects some traits of the homes, such as the number of rooms, that we do not use here.) 70% of our sample owns a home, compared to a national average of 67% in 2000. Most of the Census owners have a mortgage outstanding. With the $1,000,000 cap, the average value of a home in our sample is $190,071, with entrepreneurs tending to own higher-valued properties than wage workers. We describe in the next section some estimates of home equity that we construct with these variables. For renters, we know the monthly rental payment. To assign an implied value to rental properties, we simply use 20 times the annual rent.[11] The Census collects the date when a person moved into their home, and owners not surprisingly have a significantly longer average tenure in their properties.

Rows 24-27 report earnings estimates used in our study. From the Census long form, we collect total household income in 2000, which includes earned income, business income, and passive income. We will control for this in our estimations and contrast it with home values and price appreciation. From the LEHD, we first collect total earnings in 2000 for the individual (summing across all SEINs associated with the jobs held by the individual). We also calculate for the individual the sum of all LEHD earnings across all jobs during 1990-2000. This accumulated earnings measure is used as a proxy for the wealth of the individual in 2000, while clearly recognizing the imperfect degree to which it captures all potential elements of wealth.

4   Empirical Results

4.1   Econometric Strategy

House price changes can link to entrepreneurship through the promotion of new entrants or changes in the behavior of existing entrepreneurs. Likewise, there are multiple strategies running through the literature to separate out local demand-side effects from collateral-based effects, most notably 1) looking at variations in the degree to which industries require external finance (e.g., Rajan and Zingales, 1998), 2) considering variations in homestead exemptions by state (Berkowitz and White, 2000; Cerqueiro and Penas, 2014), 3) using renters as a control or counterfactual (e.g., Schmalz, Sraer, and Thesmar, 2014), and 4) examining price increases believed to be exogenous from demand-side effects due to geography-based housing price elasticities (e.g., Adelino, Schoar, and Severino, 2013) developed by Saiz (2010).

We approach this complicated and multifaceted problem in several steps. We start with estimations that quantify the net consequences of home price changes for the size of the entrepreneurial pool in our sample, considering both entry by wage workers and exits by incumbent

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[11]In 2000, the average multiple was 21.6 using quarterly reports from Case-Shiller and FHFA data.

entrepreneurs. During these estimations, we also examine the first two strategies of looking at the external finance dependency of industries and homestead exemption levels of states. We also adopt and extend the third strategy by focusing our regressions on home owners and using the entrepreneurial transitions of renters as a comparison group and/or control variable. We jump straight to our preferred specification to quickly establish our key findings. After we have set this groundwork, we then broaden out to robustness checks and extensions, including using the fourth strategy of Saiz (2010) instruments.

Our baseline empirical specifications take the form,

$$y_i^{04} = \beta \left[\ln(VAL_i^{00}) \cdot \ln \left(\frac{HP_z^{04}}{HP_z^{00}} \right) \right] + \gamma \ln(VAL_i^{00}) + \theta \mathbf{X}_i^{00} + \phi_z + \epsilon_i, \tag{1}$$

where y_i^{04} is an indicator variable that takes a value of one if individual i is an entrepreneur in 2004. $\ln(VAL_i^{00})$ is the log value of the individual's home in 2000. The second term in the brackets is the log change in house prices from 2000 to 2004 for the zip code z in which the individual lives in 2000. Our main interest is on the interaction of these two variables and the β coefficient. Since the value of the home in 2000 interacted with the change in house prices is equal to the increased value of home equity, β captures the elasticity of entrepreneurship with respect to an increase in home equity. As already noted, this link could be due to collateral effects, as greater equity unlocks greater lending potential, or due to wealth effects, as greater home equity increases wealth. Home values and prices are demeaned before interaction to restore main effects.

We control for the main effect of home value directly, and the γ coefficient is of interest in its own right. In addition, we control for a vector $\mathbf{X}_i^{00}$ of individual level covariates in 2000. This vector includes log household income and an indicator variable for whether the individual owns the property without a mortgage. Further, we include unreported fixed effects for the following traits of individuals, with category counts in parentheses: whether entrepreneur in 2000 (yes/no), age (9 groups), education (6 groups), gender (male/female), race (4 groups), immigration status (yes/no), marital status (married/not), LEHD earnings in 2000 (10 deciles), accumulated LEHD earnings to 2000 (10 deciles), and date of move-in to residency (6 groups). Accumulated earnings are measured relative to the respondent's state due to different durations of states in the LEHD sample. Having fixed effects for date of move-in to residency and for whether the individual owns the property without a mortgage provide strong controls for likely home equity, and below we show alternative formulations in this regard.

Finally, but quite importantly, we include fixed effects ϕ_z for the 5,909 zip codes of our respondents. These fixed effects control for the main effect of house price increases, the general rate of entrepreneurial transitions in the zip code, and related local economic conditions.

They require, per our example in the introduction, that the β coefficient be identified through variations in initial home values in 2000 for respondents living within the same zip code. The identifying assumption is that individuals with higher valued homes in 2000 benefit more from subsequent local house price appreciation than those with lower price homes.[12]

4.2 Baseline Estimations

Table 3a documents estimations using home price changes at the zip code level and including zip code fixed effects. Columns 1-5 report estimates for home owners in 2000, and Columns 6-8 report estimates for renters in 2000. We include both wage workers and entrepreneurs in 2000 in our sample, with an indicator variable for their status in 2000 introduced as a control variable. Thus, our β coefficient measures adjustments in net entry—that is, the extent to which the stock of entrepreneurship changes over the period 2000-2004 among those who were either home owners or renters in 2000. Estimates are unweighted, reflecting the random sampling of the 2000 Census from the whole US population. We cluster standard errors by zip code to reflect the price levels used.

The fourth row in Table 3a shows a strong positive association between home value in 2000 and net increase in entrepreneurship to 2004 for home owners. As the value of the house reflects individual wealth, even in the presence of our fixed effects for accumulated earnings, this relationship is quite intuitive: more wealthy people in 2000 are more likely to become entrepreneurs or remain as entrepreneurs by 2004. A similar relationship is also observed for household income. Both of these effects, however, are also observed for renters, which is important for the interpretation of our findings. This comparability remains even though the implied home value for renters is derived through their rental payments and does not reflect ownership of the dwelling. Nevertheless, wealthier people select higher rental properties on average. Reflecting Hurst and Lusardi (2004) and related work, wealthier and higher income individuals are more likely to enter into entrepreneurship over the ensuing four years independent of house price changes in their local area. This could be due to many factors: better resources for starting a business (with or without a bank loan), higher risk tolerance, and so on.

The more interesting contrast is the interaction of initial home values and price growth in the first row of Table 3a. The β coefficient for home owners is positive and statistically significant. It is modest in magnitude, as we describe in greater detail shortly, but it is nonetheless present and important. By contrast, we do not find a similar effect for renters on the interaction term.

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[12]Our specification is considering price growth x initial value. To give a specific example, if an individual owns a \$100,000 home and the local price growth is 50%, that home becomes worth \$150,000 and adds \$50,000 in home equity to the owner. Note that the added equity is orthogonal to the level of initial equity. The gain is \$50,000 for an individual regardless of whether their initial equity in the home is \$10,000 or \$90,000.

This differential is important for establishing confidence that the impact registered in Column 1 is actually due to rising home equity for home owners. We show later that this null effect for renters is not found in more relaxed specifications, suggesting that they are picking up aggregate demand effects. In the approach outlined in this table, the effects in Columns 1 and 6 are not statistically different from each other due to the large standard errors for the renter estimation. We later describe formulations under which we discern statistically different effects, in addition to the owner effect being statistically different from zero.

To demonstrate the magnitude of these coefficients, we conduct the following thought experiment that we began in the introduction. Consider two identical individuals (e.g., age, education, incomes, earnings history) living in the same zip code. The only difference between them is that one individual owns a house at the 25th percentile of value in 2000 (~\$95,000, VAL_{25}^{00}) and the other at the 75th percentile (~\$225,000, VAL_{75}^{00}). For simplicity, we assume here that equity levels in 2000 are the same, but given the lower elasticities that we observe for equity this assumption is not material for what follows.

Differencing equation (1), we would estimate the following differential in 2004 for these two individuals,

$$y_{75}^{04} - y_{25}^{04} = \beta \left[\ln \left(\frac{VAL_{75}^{00}}{VAL_{25}^{00}} \right) \cdot \ln \left(\frac{HP_z^{04}}{HP_z^{00}} \right) \right] + \gamma \left(\frac{VAL_{75}^{00}}{VAL_{25}^{00}} \right), \tag{2}$$

where $y_{75}^{04} - y_{25}^{04}$ is the greater likelihood of the individual at the 75th percentile of being an entrepreneur in 2004. All other terms in equation (1) are differenced out because these hypothetical individuals only differ in their home values. Starting with the last term, the log ratio of the home values is 0.8622 and γ is equal to 0.0111. This suggest that the individual with the higher valued home is 0.0096 more likely to be entrepreneur in 2004. This compares to 0.0681 mean for the dependent variable in 2004, or a bit over 14% in relative terms. This is roughly comparable to the unconditional initial gap of 0.0075 in entrepreneurship across individuals with these home values in 2000. (For statistics like these, we use a range of +/- \$10,000 in 2000 home values to allow for sufficient observations.)

Turning to the first term, the log ratio of the home values is again 0.8622, and we multiply this by the β coefficient (0.0095) and the log value of the average price growth of 45% (0.3733). This yields the key effect of 0.0030, which retains the statistical significance of the β coefficient. Thus, we anticipate the individual with the higher-valued home, and thus the one to stand the most from house price appreciation, to be 0.3% more likely to be an entrepreneur in 2004. This effect is quite plausible in the context of our prior calculation using the levels effects estimated by the γ coefficient. The 0.3% effect is 32% of the levels difference estimated, and we are contemplating a scenario of a 45% equity gap opening up based upon their price differentials. This is roughly 40% of the initial unconditional gap of 0.0075 in entrepreneurship across individuals with these

home values in 2000. As noted in the introduction, ignoring the log transformations, the two individuals would gain about $43,000 and $102,000 of home equity, respectively, for a differential of about $60,000, which is substantial in size.

Thus, while measurable, this induced entry is modest compared to the sample average of 6.8% in 2004 for business ownership among home owners. The relative effect of 4.5% is reported at the bottom of Columns 1-3. Going forward, we report a similar measure for upcoming specification variants. In doing so, we adjust the interaction term's coefficient and the mean of the dependent variable, but leave the other aspects of the calculation the same. For example, the 25th and 75 percentiles of home value will differ somewhat in states with high vs. low homestead exemptions. To allow comparability, however, we continue to use the same overall home price distribution.

4.2.1 Specification Alternatives

Column 2 of Table 3a documents a second variation on how we calculate home equity. Our fixed effects strategy incorporates most of the core information that we have (current monthly mortgage payment being the exception and examined later), and so this adjustment does not impact the β coefficient significantly, only the γ coefficient. This alternative route estimates the equity level based upon time since purchase, price growth, and similar data.[13] This equity estimate accounts for some of the effect that Column 1 associates with home values, but in general home values remain the stronger explanatory variable. Column 3 likewise shows comparable results when excluding the indicator variable owning without a mortgage, which makes Column 3 exactly comparable to Column 6 for the renters. To four decimal places, the reported coefficients do not change.

Columns 4-5 and 7-8 test variations on the value x price growth interactions. We use the value x price growth specification as our baseline due to its intuitive and transparent nature, but several modifications are potentially warranted. First, and most important, the format in equation (1) does not make the value x price interaction relative to the initial wealth of individuals. Thus, an expected $50,000 growth in home equity is treated the same for an individual with a fully paid-off home worth $1,000,000 as it is for an individual with just $10,000 equity in a home worth much less. The latter individual, however, has the larger wealth shock in relative terms.

While we do not observe each individual's true wealth, we can take steps to understand whether these issues are material. Our main approach is to normalize the price growth x value

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[13]We collect from Freddie Mac the average value, interest rate, and number of points on 30-year fixed rate loans for the years in which home owners in our sample moved into their homes. Using a mortgage calculator, we then quantify the expected equity levels by year of move-in for that cohort in 2000 against the original loan. Owners are assumed to have as equity all additional price growth from the time of their purchase until 2000. If no outstanding mortgage exists, we assume home equity is equal to the value of the home. We come to a very similar conclusion when using a simpler straight-line formula of a 20% down payment and the number of years the respondent has been in the home.

effect by the estimated initial home equity of the respondent. We create a metric that calculates the percentage change in home equity using the formula: (House price change 2000-2004 x Home value 2000) / (Home equity 2000). The coefficient with this approach is not directly comparable to Columns 1-3, but the bottom row of the table shows that we identify a very similar relative effect when contemplating a one standard-deviation growth in equity. We likewise find similar results when constructing a metric that normalizes the price growth x value effect by household income in 2000, the accumulated earning of the individual in the LEHD over the 1990s, or the sum of these pieces. These results suggest that our technique is robust to making the home equity increases relative to the overall financial positions of respondents. With these approaches, the renter effect is zero or negative, and we are able under these specifications to reject statistically that the owner and renter effects are the same.

Going forward, we focus on Column 1's approach since it is the most direct application of our data and the variables collected. The results are robust to these alternative set-ups.

4.2.2 Decomposing Net Effects

Our core analysis studies net changes in entrepreneurship and home price growth, providing an aggregate view that combines adjustments in the rate that wage workers enter into entrepreneurship with adjustments in the survival of existing entrepreneurs in 2000. We separate out the net changes by looking separately at new entrepreneurial transitions in Table 3b and at entrepreneurial continuations in Table 3c.

Table 3b follows the same specifications as Table 3a, but it is estimated on the sample of individuals who were wage workers in 2000, so that it measures gross entry into entrepreneurship as a function of house price increases. Similar to Table 3a, we see that home owners have a positive but modest response to increases in their home values. The relative effect on this dimension is 5.1% compared to the baseline mean for wage transitions, and the effects are precisely estimated with a β coefficient of 0.0061 (0.0030). By contrast, renters show no response to changes in house values in terms of their entry. This transition sample also provides a platform for evaluating alternative definitions of entrepreneurs. When defining a new entrepreneur to be one of the top three initial earners in the first year of new firm, we obtain a β coefficient of 0.0056 (0.0021). In this case, the relative effect of the interquartile comparison is 10.6%.

Table 3c focuses on individuals who were already entrepreneurs in 2000, and examines the extent to which increases in house values are associated with their longer continuation in entrepreneurship. The results in Table 3c are often imprecisely estimated due to the smaller sample size of existing entrepreneurs in 2000, but more importantly the magnitude of the coefficients is small. The relative effects are usually less than in Table 3b, especially in Columns 1-3 where the relative effect for incumbent survival is 0.7%. These modest effects, combined with the sig-

nificantly smaller counts of existing entrepreneurs relative to wage workers, identifies that most of the numerical increase in net entrepreneurship associated with home price appreciation came from higher rates of inflow into entrepreneurship from wage workers, rather than through the survival and growth of existing firms. In this sense, lack of statistical significance in Table 3c is as much do to weak effects as it is due to small sample sizes. It is interesting in this regard to also note that the levels effect of home equity plays a larger role for entrepreneurial continuations than it does for entrepreneurial transitions.[14]

Additional estimations consider heterogeneity in the wage worker pool. Almost all of the heightened transitions into entrepreneurship by wage workers are associated with employees of companies founded over the prior five years. This connects to findings like Gompers, Lerner, and Scharfstein (2005) on entrepreneurial transitions being more likely out of small and young businesses. A substantial share of the entry is also associated with individuals entering entrepreneurship in a different city from the one in which they lived in 2000, whereas we find the new entrepreneurs tend to open businesses relatively more frequently in the industry of past wage work with the home price growth. Likewise, educated workers and immigrants seem particularly sensitive to opening businesses following appreciation in their home values.

4.3   Collateral vs. Wealth Effects

The modest size of these effects is perhaps our most important finding, and we later test the robustness of this finding in many ways. Before doing so, however, we continue to highlight our core findings by considering the degree to which we can discern collateral vs. other wealth effects in this result.

Two sets of facts related to Tables 3b and 3c are important in suggesting that the increased value of collateral from the house price increases may be playing a limited role in the increased entrepreneurship we see. First, it is noteworthy that existing entrepreneurs seem to have no discernable response in terms of continuations, while the new entrants have a larger, albeit modest response. The responses from the Survey of Small Business Owners, as well as conventional wisdom, suggests that the increase in collateral value that comes from house price increases might be most easily factored into an existing banking relationship. Thus it would seem natural to expect that existing firms might have benefited the most if indeed the collateral channel played a major role in the relationship we observe. On the other hand, it is quite hard, in general, to get bank finance for a startup without a few years of operational history, suggesting that the response among new entrants may not be directly related to the collateral channel. The second

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[14]As noted above, the focus here is on survival in entrepreneurship (including serial entrepreneurship) rather than the survival of the original firm. We reach the same conclusions when focusing on the fates of the original businesses.

fact that casts doubt on the role of the collateral channel is the observation that a large proportion of the gross entry seems to be due to individuals moving cities to start a new business. Thus, it is unlikely that they are getting a loan on the same house that went up in value and more likely that the are able to unlock the value of the home, potentially through a sale, to use the cash to finance the business. This indirectly is a channel through which increased house prices might impact entrepreneurship, but is not the typical collateral channel invoked in the literature.

To further understand the extent to which collateral vs. wealth effects might be driving our results, we compare entrepreneurship reactions in states with high personal bankruptcy exemptions to those with low exemptions. Despite home equity loans or lines of credit being collateralized loans, Berger, Cerqueiro and Penas (2009) document that the difficulty in foreclosing such transactions in high-exemption states makes banks less willing to lend against personal property. If collateral is critical, their work suggests that we should find a stronger impact in low-exemption states, where the value of collateral is more protected and hence banks are more willing to lend when collateral potential is unlocked. We split the sample in Table 4 by whether homestead exemptions are unlimited or not, with big states in Column 2 being Florida and Texas. Most states, including California, have low exemption levels in Column 3. These splits suggest, if anything, that the reaction is higher in states with unlimited homestead exemptions. This would not be consistent with a mechanism like collateral that links home ownership to entrepreneurship through the willingness of banks to lend more.

Table 5 examines different attributes of the local lending environment. Columns 2 and 3 compare counties with a high share of commercial banks specialized in mortgage lending (as reported to the Federal Deposit Insurance Corporation) to those with relatively fewer specialist mortgage banks. We find that entrepreneurship is slightly higher in counties with lower than median share of commercial banks specializing in mortgage lending. Columns 4 and 5 similarly compare counties with high bank concentration to those with greater banking competition. The literature on bank competition suggests that more-competitive banking markets are likely to be ones where banks are more responsive to the needs of young and small businesses. Yet, again we find that if anything, the response was larger in counties with high levels of banking concentration.

Thus, these exercises in Tables 4 and 5 do not find compelling support for the role of a collateral channel. Clearly, as Table 1 depicts, collateral plays an important absolute role in the bank lending process. But, in general, we do not find evidence suggestive of home price appreciations unlocking entrepreneurship via collateral channels. Our tests have limits and thus do not rule out a role for collateral, but our evidence thus far leans towards more general wealth effects. Our results are more consistent with a view that home equity increases may lead

wealthier home owners who received larger windfall gains to be more willing to experiment with starting a new business (e.g., Lindh and Ohlsson, 1996; Anderson and Nielsen, 2012).

Table 6 continues in this theme by comparing the entrepreneurial transition elasticity for industries that are more vs. less capital intensive. Following Hurst and Lusardi (2004), we use the Survey of Small Business Finances to segment businesses based on their starting capital requirement, and we code businesses in retail and wholesale trade, as well as manufacturing as capital intensive, and businesses in services and construction as less capital intensive. Most entry occurs in sectors that are less capital intensive, and this prompts the β coefficient to be higher in Column 2 for owners. On the other hand, the relative effect is modestly larger for capital-intensive sectors at 5.7% vs. 4.9%. Thus again, industry differences do not suggest a substantial role for collateral effects.[15]

4.4 Robustness Checks and Extensions

4.4.1 Variations in Price Levels and Geographic Controls

Table 7 tests variations on specification (1) by considering different price levels and geographic controls. Columns 1-4 use home price growth at the zip code level, while Columns 5-8 consider CBSA prices. The latter sample is slightly larger, and Appendix Table 2 provides descriptive statistics. Within each group, we gradually broaden the fixed effects included from the zip code level to the regional level. Column 1 thus repeats our core specification from Table 3a. In specifications where the fixed effect is at a more-aggregated level than the price variable, we include and report a main effect for prices. The second specifications with region fixed effects also introduce a control for the CBSA-level rate at which initial renters transition from wage work into entrepreneurship. This control seeks to model differences across cities in how attractive entrepreneurship is during this period.

The most important result from Table 7 is the generally low β coefficients in all variants of Panel A. While we find effects that can be up to 73% larger than our baseline, this still only results in a relative impact of 7.8% using the interquartile comparison.

Second, and of interest from a methodological perspective, is the emergence in Panel B of an a renter effect on the interaction of implied value in 2000 and local price growth. We emphasize our baseline specification due to its ability to shut down this effect, offering greater confidence that we can identify the role of home equity increases. A general theme that emerges from this

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[15]While the literature since Rajan and Zingales (1998) typically takes stronger effects in capital-intensive sectors to be evidence for a financing effect, Adelino, Schoar, and Severino (2013) argue the opposite in their analysis of home prices and small businesses. The argument for stronger effects occurring in sectors with less capital intensity would be that the marginal gain in collateral would not be sufficient for tipping the scale on lending decisions for capital-intensive sectors given the large amounts of money involved. Either way, the overall comparability of our estimates in Columns 2 and 3 suggest limited impacts in this regard.

table is that we need a combination of zip code level price indices and zip code level fixed effects to effectively reduce our "placebo test with renters" to being statistically insignificant, while still preserving an effect for home owners. The price-level element is the more important factor, with owners and renters looking similar to each other when using CBSA-level price growth. This difference, and the general growth in elasticities, is not due to the larger sample, as we obtain very similar results using CBSA price changes within the locations where we also have price changes at the zip code level. Instead, it appears that entrepreneurship connections with CBSA-level price growth are more likely to pick-up an aggregate demand element independent of a person's finances in the city, while the zip code level prices are much more localized and reflective of how an individual's home equity adjusts. Finally, it is worth highlighting that we find in Columns 3 and 7 a direct effect of local price growth on entrepreneurship. This link, however, is even stronger for renters than for home owners. Thus, it is very difficult to interpret these parallel main effects.

More generally, we want to be careful to not push the renter comparison too far. Theoretically, the model of Bracke, Hilber, and Silva (2014) shows the ambiguity of the renter comparison when viewing home ownership and business ownership as part of a portfolio of risky assets. Empirically, even after controlling for aggregate demand, rising home prices in a local area can affect renters and their incentives towards entrepreneurship. Some renters may be discouraged from seeking to establish firms due to the fear of losing savings when the price of homes they want to buy is escalating. They may also suffer from reduced cash flow for entrepreneurship due to higher rent rates if parity to home values is maintained. On the other hand, some renters may be irrationally encouraged to entry if they believe themselves wealthier due to rising home prices around them, even if they do not directly participate. Renters may also benefit from "cheap credit" to the extent that large price appreciation fosters broader adjustments in lending standards (e.g., Glaeser and Nathanson, 2014). The renter comparison helps ground our core specification and the belief that it connects to home equity growth, but the bigger message is the general size of the coefficients present.

4.4.2   Saiz (2010) Instrument

While we believe that our fixed effect approach does a good job of controlling for aggregate demand, we also follow Adelino, Schoar, and Severino (2013) in using the housing supply elasticities developed by Saiz (2010) to instrument for actual price changes. Saiz (2010) quantifies how cities on coast lines or encircled by nearby mountains face constraints with respect to building new homes compared to cities with level and unconstrained topologies (e.g., San Francisco vs. Houston). The former cities are more likely to observe house price growth due to supply constraints compared to the latter, and these geographic features can be a foothold for isolating

price appreciation independent of aggregate demand. While these geographical features are not time varying, and thus it is not immediately clear why they would play an extra role in 2000-2004, it does seem plausible that they would influence the degree to which cities witnessed a sharp price growth.

We build our instrument for initial value x local price growth using the interaction of initial value and the local housing supply elasticity. As the instrument only varies by city, we use CBSA prices and CBSA fixed effects for this exercise. We report the results from these estimations in Table 8. Table 8 shows an OLS elasticity of 0.0169 (0.0035) for home owners and 0.0129 (0.0074) for renters in this setting. Empirically, the first stage is very strong with F statistics consistently above 30. We find that the use of this instrument reduces our coefficients. The second stage elasticities are 0.0149 (0.0063) for home owners and 0.0062 (0.0109) for renters. Thus, this approach also confirms our baseline story.

While we note these results, we are also very cautious about this instrument. In more flexible formats that attempt to instrument for both the main effect of housing prices and also the interaction effect, we do not find sufficiently stable results to completely put our faith in them. Related, when we conduct a similar exercise in Panel B of Table 8 for entrepreneurial transitions, we do not see a reduction in the IV coefficient relative to the OLS.

4.4.3 Additional Tests

Table 9 reports additional tests. We include many controls in our baseline estimates, but more are feasible. We consider in Column 2 specifications that add additional fixed effects for the following traits of individuals in 2000, with category counts in parentheses: occupation (511), industry (211), time period of immigration (8), and number of children (4). Our results persist with this approach, with the interaction coefficients being slightly diminished. Note that this diminishing in coefficient size from the baseline approach would further reinforce our findings that the effects of the home price appreciation for entry are relatively modest. Columns 3 and 4 control linearly and via fixed effects, respectively, for monthly mortgage payment levels, reaching similar conclusions. Additional estimations, like the one exhibited in Column 5, also establish that the value x price change interaction is robust to interacting price changes with other variables like household income. Columns 6 and 7 show that the results hold when excluding either the youngest or oldest members of the sample. Further tests show robustness to excluding individuals who own home without mortgage or to weighting the data such that each CBSA receives the same importance.

Our estimations focus on 2000-2004, but our data continue through 2008. We choose the shorter time period to establish a better event study given the extensive changes that can occur over eight years. Examining net changes in entrepreneurship from 2000-2008, we find almost

identical elasticities for home owners in Column 8. Looking back at Figures 1 and 2, this is not surprising as the majority of the home price adjustments occur during the initial years after 2000. When looking at the longer panel, it is no longer feasible to separate renters from owners. This too is not very surprising given that the long event window allows for confounding factors to emerge, most notably that renters might purchase a home that experiences its own price appreciation.

By looking at entry in 2004, we can also use the later period to study whether the induced entry is short-lived by examining whether the new entrant survives from 2004 until 2008. While we do not find strong differences in this regard, the evidence leans if anything towards a greater relative growth in longer-term entrants. This suggests that the additional entry associated with home price appreciation is at least as robust as a typical cohort of startups.

5   Conclusions

The financing conditions of entrepreneurs is a topic of central importance given the link of young firms to economic growth. The massive recent swings in home prices in the United States and other countries have brought renewed interest in the role of adjustments in home equity for decisions to start new firms. Home equity has the potential to play an important role since it is amenable to pledging against bank loans and because its swings can provide substantial windfalls or losses. Yet, looking at the massive price growth during 2000-2004, we find only modest connections between home price changes and rates of entrepreneurship. Moreover, what we do observe seems more consistent with general wealth effects than with the specific channel of collateral effects.

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Fig. 1: Average US House Prices

Data Source: Federal Housing Finance Agency

Our sample, zip code:
45% price growth 2000→2004
59% price growth 2000→2008
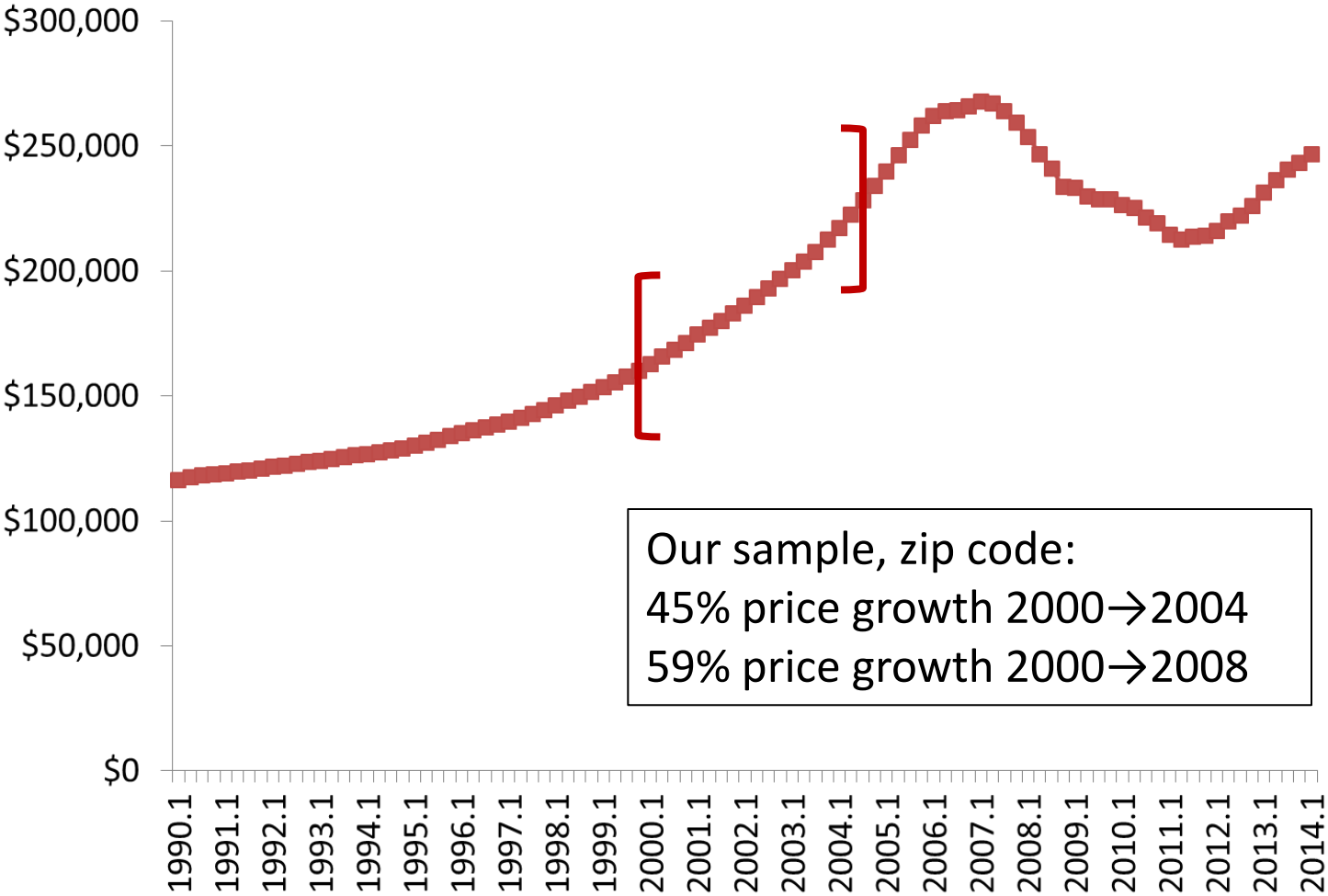
Fig. 2: Share of Young Firm Activity

Data Source: Figure 5 of Decker et al. (2014)

Figure 5

Share of Employment from Young Firms (Firms Age 5 or Less), Selected Sectors
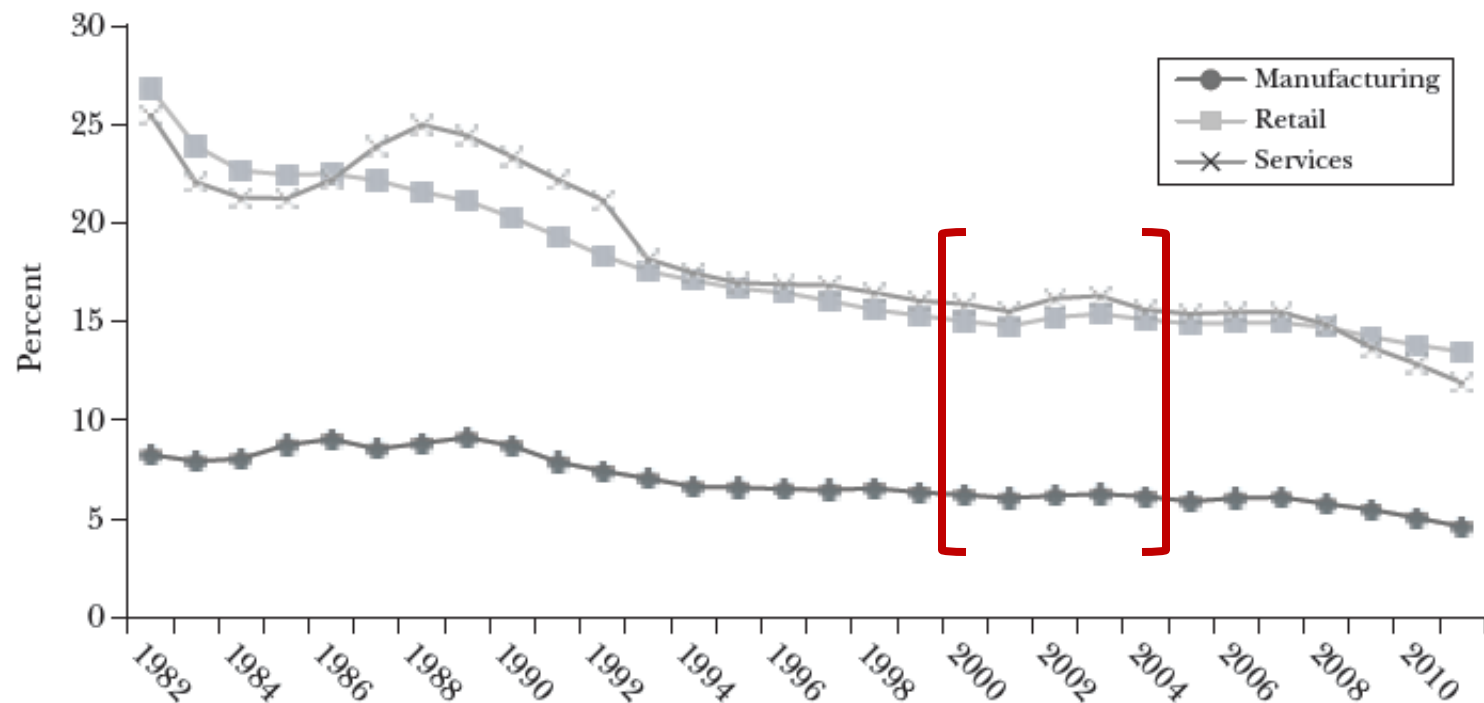
Source: Author calculations from the US Census Bureau's Business Dynamics Statistics.

Notes: Sector definitions are on an Standard Industrial Classification basis. Employment shares in each period are based on the average of employment in period $t-1$ and t (the denominator of the Davis, Haltiwanger, and Schuh (DHS) growth rate).

Figure 3: LEHD State Coverage

Start by 1995
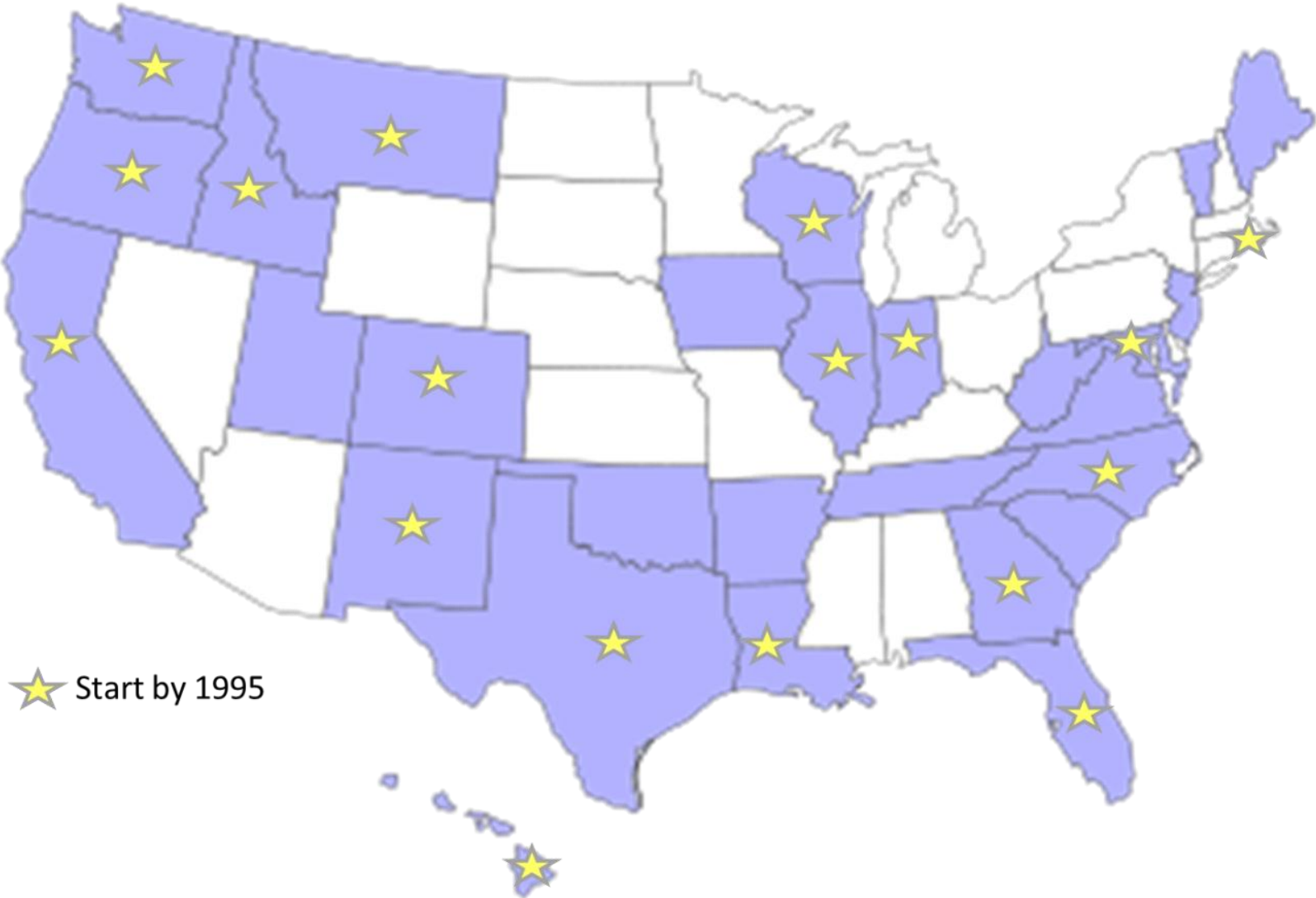
Table 1A

Home equity collateralization of loans

Notes: Based on data from the 1998 Survey of Small Business Finances. The specific results are based on a sub-sample of firms that were less than 10 years old and had under 50 employees at the time of the survey. Percentages are not corrected for sample weights in the survey.

	Share secured by collateral	Share secured by personal real estate	Fraction of collateralized loans secured by personal real estate
	(1)	(2)	(3)
Mortgage	88%	55%	63%
Line of credit	44%	12%	28%
Equipment loan	67%	2%	3%
Other loans	37%	9%	25%
Weighted average	56%	19%	34%

Table 1B

Home equity collateralization of loans

Notes: See Table 1A.

Question	Share of eligible respondents who answered "Yes"
Personal real estate was used to secure the most recent loan	19%
Lack of collateral was the official reason why the loan was turned down	9%
Did not apply for a loan because feared rejection due to lack of collateral	6%

Table 2

Descriptive statistics on LEHD sample with zip code prices

Notes: This table provides descriptive statistics on our sample. Our sample includes working individuals present in 2000, 2004, and 2008 in a CBSA in one of 16 states included in the LEHD by 2000: AR, CA, CO, FL, ID, IL, IN, LA, MD, NC, NM, OK, OR, TX, WA, and WI. Demographic traits are measured in 2000. Per Census Bureau disclosure requirements, listed observation counts are rounded.

	Respondent occupation in 2000	All	Wage	Wage	Entrepreneur	Entrepreneur
	Respondent home ownership in 2000	All	Owner	Renter	Owner	Renter
		(1)	(2)	(3)	(4)	(5)
(1)	N	826,530	550,890	231,550	30,990	13,100
(2)	Share	1.0000	0.6665	0.2801	0.0375	0.0158
(3)	Zip code house price 2004 / price 2000	1.4525	1.4269	1.5104	1.4466	1.5285
(4)	Zip code house price 2008 / price 2000	1.5927	1.5622	1.6626	1.5802	1.6851
(5)	Business owner 2000	0.0533	n.a.	n.a.	1.0000	1.0000
(6)	Business owner 2004	0.0669	0.0385	0.0430	0.5941	0.4370
(7)	Business owner 2008	0.0702	0.0487	0.0520	0.4805	0.3278
(8)	Survival of SEIN in 2000 to 2004	0.8548	0.8699	0.8423	0.7518	0.6822
(9)	Survival of SEIN in 2000 to 2008	0.7558	0.7797	0.7330	0.6015	0.5173
(10)	Age	38.105	39.35	35.20	38.87	35.20
(11)	Male	0.5301	0.5283	0.5239	0.5892	0.5779
(12)	Hispanic	0.1311	0.1083	0.1851	0.1074	0.1946
(13)	African American	0.0730	0.0530	0.1258	0.0321	0.0771
(14)	Asian	0.0590	0.0535	0.0688	0.0686	0.0916
(15)	Immigrant	0.1682	0.1447	0.2173	0.1774	0.2652
(16)	Married	0.7278	0.8261	0.4918	0.8637	0.5107
(17)	Bachelor's education and higher	0.3865	0.4176	0.3157	0.4000	0.2982
(18)	Renter	0.2960	n.a.	1.0000	n.a.	1.0000
(19)	Own with mortgage	0.6721	0.9546	n.a.	0.9554	n.a.
(20)	Own without mortgage	0.0319	0.0454	n.a.	0.0446	n.a.
(21)	Home value (max=$1 million)	190,071	188,688	n.a.	214,654	n.a.
(22)	Implied rental value	169,697	n.a.	169,141	n.a.	179,539
(23)	Move-in date	1993.6	1992.5	1996.1	1992.9	1996.1
(24)	Household income (max=$2.5 million)	78,074	88,754	51,041	100,147	54,526
(25)	LEHD earnings 2000	45,423	51,057	31,838	52,646	31,590
(26)	LEHD earnings 2004	55,147	61,051	40,663	64,237	41,408
(27)	LEHD earnings 2008	64,844	70,807	49,945	75,918	51,280

Table 3a

Estimations of net entrepreneurship using home values and prices for respondents in 2000

Notes: This table reports regressions quantifying net entry effects that combine entrepreneurs and wage workers in 2000. Columns 1-5 consider home owners, with a specific focus on their home values and local price changes. Columns 6-8 consider renters with the implied value of the dwelling. Price changes are specific to a respondent's zip code. Regressions include unreported fixed effects for the following traits of individuals, with category counts in parentheses: whether entrepreneur in 2000 (1), zip code of residence (5909), age (9), education (6), gender (1), race (4), immigration status (1), marital status (1), LEHD earnings in 2000 (10), accumulated LEHD earnings to 2000 (10), and date of move-in to residency (6). Accumulated earnings are measured relative to the respondent's state due to different durations of states in the LEHD sample. Reported regressors are in log values excepting equity change variables and indicator variables. Regressors are demeaned prior to interactions to restore main effects. Standard errors are clustered at the zip code level.

Home ownership status in 2000	Owner					Renter		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Home value 2000 * Price change 2000-2004	0.0095	0.0095	0.0095			0.0025		
	(0.0034)	(0.0034)	(0.0034)			(0.0060)		
Equity change / Estimated initial home equity				0.0013			-0.0007	
				(0.0006)			(0.0010)	
Equity change / (Initial income + home equity)					0.0038			0.0000
					(0.0011)			(0.0012)
Home value 2000	0.0111	0.0076	0.0111	0.0107	0.0084	0.0039	0.0040	0.0039
	(0.0008)	(0.0024)	(0.0008)	(0.0008)	(0.0010)	(0.0015)	(0.0015)	(0.0019)
(0,1) own home without mortgage	0.0000			0.0013	0.0010			
	(0.0014)			(0.0014)	(0.0014)			
Estimated initial home equity 2000		0.0036						
		(0.0023)						
Household income 2000	0.0061	0.0061	0.0061	0.0061	0.0086	0.0025	0.0025	0.0025
	(0.0008)	(0.0008)	(0.0008)	(0.0008)	(0.0011)	(0.0010)	(0.0010)	(0.0016)
Number of observations	581,880	581,880	581,880	581,880	581,880	244,650	244,650	244,650
Mean of dependent variable	0.0681	0.0681	0.0681	0.0681	0.0681	0.0641	0.0641	0.0641
75th-25th interaction differential / mean of DV	0.0449	0.0449	0.0449			0.0126		
1 SD equity change / mean of DV				0.0372	0.0418		-0.0213	0.0000

Table 3b

Table 3a isolating entrepreneurship transitions from wage work in 2000

Notes: See Table 3a. Sample is restricted to wage workers in 2000.

Home ownership status in 2000	Owner					Renter		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Home value 2000 * Price change 2000-2004	0.0061	0.0060	0.0060			0.0004		
	(0.0030)	(0.0030)	(0.0030)			(0.0056)		
Equity change / Estimated initial home equity				0.0008			-0.0007	
				(0.0005)			(0.0009)	
Equity change / (Initial income + home equity)					0.0031			-0.0003
					(0.0011)			(0.0011)
Home value 2000	0.0059	0.0055	0.0060	0.0056	0.0037	0.0040	0.0040	0.0043
	(0.0007)	(0.0022)	(0.0007)	(0.0007)	(0.0009)	(0.0014)	(0.0014)	(0.0017)
(0,1) own home without mortgage	-0.0020			-0.0013	-0.0013			
	(0.0012)			(0.0013)	(0.0013)			
Estimated initial home equity 2000		0.0005						
		(0.0021)						
Household income 2000	0.0045	0.0045	0.0045	0.0045	0.0065	0.0029	0.0029	0.0026
	(0.0007)	(0.0007)	(0.0007)	(0.0007)	(0.0010)	(0.0009)	(0.0009)	(0.0015)
Number of observations	550,890	550,890	550,890	550,890	550,890	231,550	231,550	231,550
Mean of dependent variable	0.0385	0.0385	0.0385	0.0385	0.0385	0.0430	0.0430	0.0430
75th-25th interaction differential / mean of DV	0.0510	0.0502	0.0502			0.0030		
1 SD change / mean of DV				0.0405	0.0603		-0.0317	-0.0052

Table 3c

Table 3a isolating continuation of entrepreneurship in 2000 to 2004

Notes: See Table 3a. Sample is restricted to owners in 2000 and their continuation in entrepreneurship.

Home ownership status in 2000	Owner					Renter		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Home value 2000 * Price change 2000-2004	0.0119	0.0131	0.0122			-0.0231		
	(0.0321)	(0.0321)	(0.0322)			(0.0667)		
Equity change / Estimated initial home equity				0.0162			0.0067	
				(0.0065)			(0.0114)	
Equity change / (Initial income + home equity)					0.0261			0.0079
					(0.0102)			(0.0131)
Home value 2000	0.0869	0.0440	0.0854	0.0866	0.0703	0.0110	0.0102	0.0025
	(0.0080)	(0.0246)	(0.0080)	(0.0080)	(0.0103)	(0.0165)	(0.0162)	(0.0203)
(0,1) own home without mortgage	0.0283			0.0454	0.0352			
	(0.0151)			(0.0163)	(0.0153)			
Estimated initial home equity 2000		0.0428						
		(0.0239)						
Household income 2000	0.0224	0.0225	0.0227	0.0223	0.0401	-0.0089	-0.0091	-0.0006
	(0.0066)	(0.0066)	(0.0066)	(0.0067)	(0.0095)	(0.0112)	(0.0112)	(0.0178)
Number of observations	30,990	30,990	30,990	30,990	30,990	13,100	13,100	13,100
Mean of dependent variable	0.5941	0.5941	0.5941	0.5941	0.5941	0.4370	0.4370	0.4370
75th-25th interaction differential / mean of DV	0.0064	0.0071	0.0066			-0.0170		
1 SD change / mean of DV				0.0532	0.0329		0.0299	0.0135

Table 4

Sample partition by level of state homestead exemption

Notes: See Tables 3a-c. Columns 2 and 3 partition by whether the state has unlimited homestead exemptions.

PANEL A - Home Owners & Net Entry			
Dependent variable	Entrepreneur in	State homestead exemption	
	2004	Unlimited	Limited
	(1)	(2)	(3)
Home value 2000 * Price change 2000-2004	0.0094	0.0159	0.0072
	(0.0034)	(0.0073)	(0.0039)
Number of observations	581,880	152,725	429,155
Mean of dependent variable	0.0681	0.0773	0.0648
75th-25th interaction differential / mean of DV	0.0444	0.0662	0.0358
PANEL B - Home Owners & New Entry from Wage Workers			
Home value 2000 * Price change 2000-2004	0.0061	0.0082	0.0050
	(0.0030)	(0.0070)	(0.0034)
Number of observations	550,890	143,790	407,100
Mean of dependent variable	0.0385	0.0446	0.0363
75th-25th interaction differential / mean of DV	0.0510	0.0592	0.0443
PANEL C - Home Owners & Continuation of Entrepreneurship			
Home value 2000 * Price change 2000-2004	0.0119	0.0180	0.0070
	(0.0321)	(0.0602)	(0.0380)
Number of observations	30,990	8,930	22,060
Mean of dependent variable	0.5941	0.6026	0.5907
75th-25th interaction differential / mean of DV	0.0064	0.0096	0.0038

Table 5

Sample partitions by banking market structure

Notes: See Tables 3a-c. Columns 2-5 partition by county-level banking conditions.

	Entrepreneur in 2004	County mortgage lending		County bank HHI	
		Low	High	Low	High
Dependent variable	(1)	(2)	(3)	(4)	(5)
PANEL A - Home Owners & Net Entry					
Home value 2000 * Price change 2000-2004	0.0094	0.0153	0.0084	0.0092	0.0107
	(0.0034)	(0.0058)	(0.0051)	(0.0048)	(0.0054)
Number of observations	581,880	282,580	299,300	307,220	274,660
Mean of dependent variable	0.0681	0.0693	0.0669	0.0686	0.0675
75th-25th interaction differential / mean of DV	0.0444	0.0711	0.0402	0.0431	0.0512
PANEL B - Home Owners & New Entry from Wage Workers					
Home value 2000 * Price change 2000-2004	0.0061	0.0123	0.0020	0.0041	0.0102
	(0.0030)	(0.0055)	(0.0044)	(0.0042)	(0.0049)
Number of observations	550,890	267,680	283,210	290,320	260,570
Mean of dependent variable	0.0385	0.0394	0.0376	0.0389	0.0380
75th-25th interaction differential / mean of DV	0.0510	0.1001	0.0170	0.0337	0.0864
PANEL C - Home Owners & Continuation of Entrepreneurship					
Home value 2000 * Price change 2000-2004	0.0119	0.0430	0.0455	0.0082	0.0169
	(0.0321)	(0.0539)	(0.0486)	(0.0442)	(0.0538)
Number of observations	30,990	14,900	16,090	16,910	14,080
Mean of dependent variable	0.5941	0.6056	0.5835	0.5785	0.6129
75th-25th interaction differential / mean of DV	0.0064	0.0229	0.0251	0.0046	0.0089

Table 6

Estimations of sector choice by transitioning wage workers

Notes: See Table 3b. This table reports regressions that identify the characteristics of the sector entered by transitioning wage workers.

Dependent variable	Entrepreneur in 2004	Capital intensity		Sector market focus	
		High	Low	Nontradables	Tradables
	(1)	(2)	(3)	(4)	(5)
Home value 2000 * Price change 2000-2004	0.0061	0.0019	0.0042	0.0013	0.0048
	(0.0030)	(0.0016)	(0.0026)	(0.0015)	(0.0027)
Number of observations	550,890	550,890	550,890	550,890	550,890
Mean of dependent variable	0.0385	0.0107	0.0278	0.0103	0.0282
75th-25th interaction differential / mean of DV	0.0510	0.0572	0.0486	0.0406	0.0548

Table 7

Variations on house price levels and geographic fixed effects

Notes: See Table 3a. Estimations repeat Columns 1 and 6 of Table 3a showing variations on house price levels (zip code vs. CBSA) and geographic fixed effects (zip code vs. CBSA vs. region). Where appropriate, the main effect for house price is introduced and reported. Extensions with region fixed effects test the inclusion of the entry rate for renters between 2000 and 2004 as an additional control variable. Appendix Table 2 provides descriptive statistics for CBSA price sample.

PANEL A - Home Owners								
Price level	Zip				CBSA			
Geographic fixed effect level	Zip	CBSA	Region	Region	Zip	CBSA	Region	Region
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Home value 2000 * Price change 2000-2004	0.0094	0.0127	0.0097	0.0115	0.0121	0.0164	0.0097	0.0121
	(0.0034)	(0.0030)	(0.0029)	(0.0029)	(0.0039)	(0.0035)	(0.0033)	(0.0032)
Price change 2000-2004		0.0080	0.0065	0.0005			0.0092	0.0012
		(0.0057)	(0.0023)	(0.0022)			(0.0029)	(0.0029)
CBSA Rental Entry Rate				0.6543				0.5821
				(0.0480)				(0.0431)
Number of observations	581,880	581,880	581,880	581,880	681,410	681,410	681,410	681,410
Mean of dependent variable	0.0681	0.0681	0.0681	0.0681	0.0678	0.0678	0.0678	0.0678
75th-25th interaction differential / mean of DV	0.0444	0.0600	0.0458	0.0544	0.0574	0.0779	0.0460	0.0574
PANEL B - Renters								
Home value 2000 * Price change 2000-2004	0.0025	0.0049	0.0066	0.0067	0.0109	0.0146	0.0119	0.0127
	(0.0060)	(0.0054)	(0.0050)	(0.0049)	(0.0070)	(0.0063)	(0.0058)	(0.0058)
Price change 2000-2004		-0.0019	0.0102	0.0021			0.0167	0.0048
		(0.0074)	(0.0029)	(0.0028)			(0.0038)	(0.0038)
CBSA Rental Entry Rate				0.9234				0.9056
				(0.0681)				(0.0605)
Number of observations	244,650	244,650	244,650	244,650	286,170	286,170	286,170	286,170
Mean of dependent variable	0.0641	0.0641	0.0641	0.0641	0.0641	0.0641	0.0641	0.0641
75th-25th interaction differential / mean of DV	0.0126	0.0246	0.0331	0.0336	0.0547	0.0733	0.0598	0.0638

Table 8

IV estimations using Saiz (2010) housing price elasticity

Notes: See Table 7. Estimations include CBSA fixed effects and prices following Column 6 of Table 7. Columns 2 and 4 instrument for Home value 2000 * Price change 2000-2004 with the interaction of home price in 2000 and the elasticity for local housing price growth calculated by Saiz (2010).

PANEL A - Home Owners & Net Entry				
Group	Owner	Owner	Renter	Renter
Technique	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Home value 2000 * Price change 2000-2004	0.0169	0.0149	0.0129	0.0062
	(0.0035)	(0.0063)	(0.0074)	(0.0109)
Number of observations	628,830	628,830	263,080	263,080
F statistics in the first stage		39.8		30.2

PANEL B - Home Owners & New Entry from Wage Workers				
Group	Owner	Owner	Renter	Renter
Technique	OLS	IV	OLS	IV
	(1)	(2)	(3)	(4)
Home value 2000 * Price change 2000-2004	0.0137	0.0154	0.0093	0.0093
	(0.0029)	(0.0057)	(0.0053)	(0.0079)
Number of observations	595,450	595,450	248,860	248,860

Table 9

Robustness checks

Notes: See Table 3a.

	PANEL A - Home Owners & Net Entry							
	Baseline estimation for being entrepreneur in 2004	Including fixed effects for occupation (511), industry (211), time period of immigration (8), and number of children (4)	Including log control for monthly mortgage payment	Including fixed effects for monthly mortgage payment (10)	Including additional regressor for interaction of price changes and 2000 household income	Excluding individuals less than 30 years old	Excluding individuals greater than 45 years old	Considering entry rate to 2008
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Home value 2000	0.0094	0.0074	0.0088	0.0071	0.0131	0.0077	0.0120	0.0105
* Price change 2000-2004	(0.0034)	(0.0034)	(0.0032)	(0.0032)	(0.0038)	(0.0035)	(0.0040)	(0.0038)
Number of observations	581,880	581,880	581,880	581,880	581,880	531,345	458,450	581,880
Mean of dependent variable	0.0681	0.0681	0.0681	0.0681	0.0681	0.0675	0.0709	0.0717
75th-25th / mean of DV	0.0444	0.0350	0.0416	0.0336	0.0619	0.0367	0.0545	0.0471
	PANEL B - Home Owners & New Entry from Wage Work in 2000							
Home value 2000	0.0061	0.0046	0.0054	0.0042	0.0105	0.0050	0.0084	0.0056
* Price change 2000-2004	(0.0030)	(0.0030)	(0.0030)	(0.0031)	(0.0034)	(0.0032)	(0.0036)	(0.0034)
Number of observations	550,890	550,890	550,890	550,890	550,890	503,060	433,165	550,890
Mean of dependent variable	0.0385	0.0385	0.0385	0.0385	0.0385	0.0375	0.0408	0.0487
75th-25th / mean of DV	0.0510	0.0385	0.0451	0.0351	0.0878	0.0429	0.0663	0.0370

Appendix Table 1

Comparison of mobility rates in LEHD sample to full 2000 Census

Notes: This table compares the migration behavior of the respondents included in our sample with everyone present in the 2000 Census.

| | Move from within the US | | | Move from | | |
| | Total | Within State | Out-of State | outside US | N | % |
	(1)	(2)	(3)	(4)	(5)	(6)
A. Our sample						
Own with mortgage in 2000	47.8	40.8	7.1	0.9	644,732	0.66
Own without mortgage in 2000	21.1	18.3	2.8	0.6	37,708	0.04
Rent in 2000	73.6	58.2	15.4	4.1	296,523	0.30
					978,963	
B. Full sample for the LEHD states						
Own with mortgage in 2000	47.6	39.7	7.9	1.0	1,868,113	0.64
Own without mortgage in 2000	22.1	18.6	3.5	0.5	172,928	0.06
Rent in 2000	75.1	57.4	17.7	4.4	861,486	0.30
					2,902,527	
C. Full sample for all states						
Own with mortgage in 2000	46.0	38.2	7.9	0.8	4,273,307	0.66
Own without mortgage in 2000	20.7	17.3	3.5	0.4	429,096	0.07
Rent in 2000	74.1	55.7	17.7	4.2	1,752,782	0.27
					6,455,185	

Appendix Table 2

Descriptive statistics on LEHD sample with city-level prices

Notes: See Table 2. Provides sample traits for individuals with CBSA-level prices.

	Respondent occupation in 2000	All	Wage	Wage	Entrepreneur	Entrepreneur
	Respondent home ownership in 2000	All	Owner	Renter	Owner	Renter
		(1)	(2)	(3)	(4)	(5)
(1)	N	976,870	653,570	271,070	36,800	15,430
(2)	Share	1.0000	0.6690	0.2775	0.0377	0.0158
(3)	Zip code house price 2004 / price 2000	1.4525	1.4269	1.5104	1.4466	1.5282
(4)	Zip code house price 2008 / price 2000	1.5927	1.5622	1.6626	1.5805	1.6849
(5)	Business owner 2000	0.0535	n.a.	n.a.	1.0000	1.0000
(6)	Business owner 2004	0.0667	0.0383	0.0428	0.5911	0.4381
(7)	Business owner 2008	0.0702	0.0488	0.0520	0.4779	0.3271
(8)	Survival of SEIN in 2000 to 2004	0.8529	0.8679	0.8403	0.7503	0.6846
(9)	Survival of SEIN in 2000 to 2008	0.7534	0.7772	0.7300	0.6015	0.5184
(10)	Age	38.07	39.30	35.17	38.82	35.17
(11)	Male	0.5281	0.5264	0.5215	0.5846	0.5780
(12)	Hispanic	0.1387	0.1167	0.1907	0.1183	0.2043
(13)	African American	0.0771	0.0562	0.1329	0.0340	0.0865
(14)	Asian	0.0538	0.0485	0.0637	0.0627	0.0842
(15)	Immigrant	0.1600	0.1378	0.2068	0.1712	0.2526
(16)	Married	0.7280	0.8254	0.4911	0.8349	0.5099
(17)	Bachelor's education and higher	0.3774	0.4064	0.3115	0.3838	0.2893
(18)	Renter	0.2933	n.a.	1.0000	n.a.	1.0000
(19)	Own with mortgage	0.6597	0.9335	n.a.	0.9332	n.a.
(20)	Own without mortgage	0.0384	0.0665	n.a.	0.0668	n.a.
(21)	Home value (max=$1 million)	180,047	178,750	n.a.	203,117	n.a.
(22)	Implied rental value	163,731	n.a.	163,242	n.a.	172,317
(23)	Move-in date	1993.5	1992.4	1996.1	1992.9	1996.1
(24)	Household income (max=$2.5 million)	76,232	86,479	49,965	97,360	53,252
(25)	LEHD earnings 2000	44,286	49,624	31,235	51,174	30,998
(26)	LEHD earnings 2004	53,901	59,508	40,000	62,357	40,502
(27)	LEHD earnings 2008	64,000	69,745	49,542	74,071	50,659